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ABSTRACT
The purpose of this Guide, for school administrators and board members, is to provide newcomers in television with an understanding of Instructional Television (ITV) facilities for school and school systems. The discussions herein provide the reader with information and direction to enable him to select the best facilities for his purposes. For further information, reference is made to a longer, more comprehensive publication upon which this version is partly based - "Instructional Television Facilities: A Planning Guide" by John P. Witherspoon and William J. Kessler. Three documents include the educational value of ITV, planning suggestions for school administrators and school board members, and a list of current related documents available from ERIC Document Reproduction Service. (LS)

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PREP

INSTRUCTIONAL TELEVISION FACILITIES

A Guide for School Administrators and Board Members

No. 1-A

PREP is . . .

- *a synthesis and interpretation of research, development, and current practice on a specific educational topic*
- *a method of getting significant R&D findings to the practitioner quickly*
- *the best thinking of researchers interpreted by specialists in simple language*
- *the focus of research on current educational problems*
- *a format which can be easily and inexpensively reproduced for wide distribution*
- *raw material in the public domain which can be adapted to meet local needs*
- *an attempt to improve our Nation's schools through research*

P*utting*
R*esearch into*
E*ducational*
P*ractice*

This *Guide* was written by Dr. Kenneth E. Oberholtzer, a former school superintendent whose school district was among the first group of schools to apply for and be granted an FCC license, a VHF channel--Channel 6 in Denver, Colorado. The purpose of the *Guide* is to provide the reader with an understanding of instructional television facilities for schools and school systems. The discussion is primarily directed to school board members and school administrators who have the responsibility for making decisions on many kinds of equipment (facilities) for their schools. The *Guide* is for the newcomer in television, not the sophisticated user.

Technical equipment, such as television facilities, can be baffling to the novice unless he has a background in physics, electronics, and telecommunications. This discussion should provide him with information and direction to enable him to select the best facilities for his purposes.

The *Guide* is a brief, succinct treatment of instructional television facilities, written with the expectation that further information will be needed on some of the subjects presented. Assistance is given on how to locate additional information, and the reader is also referred to the longer, more comprehensive publication upon which this version is partly based--*Instructional Television Facilities: A Planning Guide*--written by John P. Witherspoon and William J. Kessler, scheduled to be published in late 1969. Advance announcement of its availability will be made through PREP.

Division of Information Technology and Dissemination
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INSTRUCTIONAL TELEVISION (ITV) AND ITS EDUCATIONAL VALUE

Instructional television is an important medium in the field of instructional technology. Instructional technology includes a variety of media, such as the book, television, radio, the computer, and the telephone. Television is one important medium. As a medium it neither teaches nor learns, but a teacher can use television to teach either effectively or poorly. Also a student can use television to learn effectively or poorly.

But technology is also much more than an assembly of media. What does the term *instructional technology* mean? It is both a *means* and a *process*. As a means, it provides a vehicle for communicating; it is an *instrument* of education. As a *process* instructional technology is the dividing and subdividing of an educational task or need into its component parts, which usually leads to the development of a systems approach to instruction. And *a systems approach* means basically that (1) the objectives of instruction are stated, (2) appropriate teaching-learning activities are designed, and (3) the activities are evaluated in terms of the objectives. Systems also is sometimes thought of as the relating of several media in teaching-learning activities.

So the use of technology, which may include the use of instructional television, usually involves a structuring, an organizing of instruction which applies to both the teaching and the learning activities. Such organizing for instructional television may or may not follow the typical classroom textbook teaching and learning activities. More often it should not.

Instructional television should be thought of as one means of teaching learning in the field of instructional technology. Rarely has it been used effectively alone. The old saying "Variety is the spice of life" applies to teaching-learning activities, and instructional television should be considered together with other means in a systems approach to instruction.

There are zealous advocates and opponents of instructional television; there are optimists and pessimists. Television is not a cure-all for the educational ills of our day, but it is capable of helping to do much more than it has done in our schools.

The quality of television facilities has been improving rapidly in recent years and more improvements are on the way. There is a large array of excellent facilities that you can buy, now that television has been accepted as a means of entertaining and informing people.

Public television has grown in both quality of programing and in its audience through the expanding networks of noncommercial (educational

television, ETV) stations. Instructional television (television in schools and colleges) is growing too. More school administrators and school board members are becoming interested in making effective use of television in their schools.

Fundamentally, television can be the means of performing two essential educational tasks: extending educational opportunities to more students and improving the quality of teaching-learning activities. Many good uses have been made of television in elementary, secondary, and adult schools; however, the best uses have been made where a careful study preceded the purchase of facilities. There is no doubt that television can be the means of meeting many specific educational objectives and needs, economically and effectively. Television can reach individuals, tens, hundreds, or thousands quickly, accurately, and effectively.

Instructional television should help to meet the educational needs of your students. Those who plan school programs must look at both educational objectives and educational needs. Objectives are the guideposts which you have accepted for your schools, such as, To teach students how to read. Pertinent to the objective will be some educational needs within the scope of the objective. For example, there is a need for language development and other intellectual growth necessary to preparation for reading. Where such language development or growth is lacking, television has been used effectively to assist parents in preparing their children for beginning reading.

Or, to use the reading objective again, the need may be to motivate students further, to stimulate their interest in particular kinds of reading activities. Television can provide vicarious experiences, live and recorded, at regular or irregular intervals to meet such needs. Television can bring outstanding teachers and unusual experiences to the classroom, conveniently and economically.

The determination of educational objectives and the analysis of educational needs are a necessity if instructional technology, including instructional television, is to be effectual. Private corporations which have attempted to sell technical facilities and curriculum materials have been critical of the schools because, they say, the schools have not been able or willing to state their needs in precise, concise terms. Such statements are required if one is to make the best use of technical facilities. Our technical know-how is much ahead of our related instructional know-how. Or, as is sometimes stated, our "hardware" is way ahead of our related "software."

A school district may want to start with pilot ITV projects in a few schools, with the instruction designed to meet the needs of students in those schools first. The initial work may be with a closed-circuit or a 2500 megacycle (mc) operation. As experience is gained you can expand into open-circuit, Very High Frequency (VHF), or Ultra High Frequency (UHF) 1/ operations. You may even want to start an operation in one school, possibly in one room. Start with what you consider to be a manageable operation.

Open-circuit instructional television began in the 1950's with the emphasis on teacher activities, with teachers talking to students in their usual manner. Now the emphasis is more on a balance between teacher and student activities, between meeting teachers' needs and students' needs. Student activities can go much beyond listening and seeing.

Furthermore, instructional television should be thought of as not merely an aid, but as an integral, central feature of teaching-learning. Keep in mind also that television is probably most effective when it is used in context with other means of teaching-learning technologies. Your analysis of needs can determine much about what you should try to do with instructional television.

SOURCES OF ITV MATERIALS

The incorporation of televison into your instructional program requires more than facilities. You will need specially designed curriculum materials, specially trained personnel, and a means of relating materials and personnel to facilities.

Curriculum materials, specially designed for television, are available by sale or rental from a variety of sources. Aside from school districts some of the best known sources 2/ of recorded materials are:

Ampex Tape Exchange, 2201 Lunt Ave., Elk Grove Village, Ill. 60007
An exchange and distribution service for instructional and training courses and modules.

Center for Instructional Television, Eastern Education Network, 575 Technology Square, Cambridge, Mass. 02139
Instructional courses available to schools and educational television stations within the Eastern network area.

1/ These terms are explained later.

2/ Reported by Ken Winslow, *Educational/Instructional Broadcasting*, Vol. 1, No. 4, Sept.-Oct. 1968.

Great Plains National Instructional Television Library, University of Nebraska, Lincoln, Neb., 68508
Instructional courses and supplementary materials available to recognized educational institutions. Cover preschool through college level.

Midwest Program on Airborne Television Instruction, Inc., Memorial Center, Purdue University, Lafayette, Ind. 47902
Instructional courses and supplementary materials available to recognized educational institutions. Cover preschool through college level.

Modern Talking Picture Service, 1212 Avenue of the Americas, New York, New York 10036
Portions of existing library of free-loan 16 mm. titles now available on videotape.

National Center for School and College Television, Box A, Bloomington, Ind. 47401
Instructional courses and supplementary materials available to recognized educational institutions. Cover preschool through college level.

Western Video Industries, 1514 North Vine St., Los Angeles, Calif. 90028
Instructional courses and supplementary materials available to recognized educational institutions. Cover preschool through college level.

Other sources of materials are educational television stations and colleges, and some school districts have available materials for exchange.

You will undoubtedly want to produce some materials. Visit your nearby colleges and school systems which have produced programs. Also communicate with the National Center for School and College Television at Bloomington, Ind., and the Great Plains National Instructional Television Library at Lincoln, Neb., both of whom have had much experience in appraising curriculum materials for television. Lawrence E. McKune of Michigan State University, East Lansing, published a *Compendium of Televised Education*, which lists the numbers and types of programs produced, used, and distributed. This publication would be useful to you in producing your own.

To produce curriculum materials for television you need teachers, writers, artists, performers, pupils, and technicians. They all need training. Some persons can be located within your schools; some can be hired from other operations; and some can be obtained from training centers in colleges. Much of the training, however, will have to be on-the-job types of training.

Typical mistakes made in producing programs are: (1) There is a limited, insufficient supply of materials on hand; (2) there are too few personnel available for production of materials--often the personnel has had minimal training; and (3) insufficient time is allowed for the producers, the performers, and the technicians to work together before the lesson goes on the air.

Television has a voracious appetite for materials. It takes time and talent to produce good materials. Not every good teacher makes a good writer or performer. Wanting to work in television is a prime requisite. Willingness to work hard is another. Experience with a supervisor and a consultant helps. Studio time for rehearsal is too often not provided. This places all parties to the television lesson in a bad light. Practice is needed for both live and prerecorded lessons.

Personnel, facilities, and materials are essential to good instructional television. If any one party to the operation is deficient, the result is not good. Then television is no good. When all parties work well together the teaching-learning activities can be highly effectual, and television is good.

SOURCES OF PLANNING ASSISTANCE

Seek expert assistance in your planning. Consult your nearest college--its library and its department of communications or engineering department. Study books and periodicals. To make a good beginning, read these publications:

Brown, James W.; Lewis, Richard B.; and Harcleroad, Fred F. *A-V Instruction Materials and Methods*, 2d Ed. New York, N.Y.: McGraw-Hill, 1964.

Diamond, Robert M., ed. *A Guide To Instructional Television*, New York, N.Y.: McGraw-Hill, 1964.

Dreyfus, Lee S., and Bradley, Wallace M., ed. *Television Instruction*, Mass Communications Center, Detroit, Mich.: Wayne State University, 1962

The Educational Facilities Laboratories, Inc., *Design for ETV Planning for Schools with Television*, New York, N.Y.: The Laboratories, 1964.

Frazier, A., and Wigren, H.E., ed. *Interaction in Learning: Implications for Television*, Washington, D.C.: National Education Association, 1960

Kessler, William J., *Fundamentals of Televison Systems*. Seminar on Learning and Television, Project for the Improvement of Televised Instruction, 1966. Washington, D.C.: National Association of Educational Broadcasters.

Lewis, Philip. *Educational Television Guidebook*, New York: *McGraw-Hill 1961.*

Murphy, Judith , and Gross, Ronald. *Learning by Television*, New York, N.Y.: The Fund For the Advancement of Education, 1966.

Scramm, Wilbur; Coombs, Philip H; Kahnert, Friedrick; and Lyle, Jack. *The New Media:* Memo to Educational Planners, UNESCO. New York, N.Y.: International Institute for Educational Planning, 1967.

Locate and view ITV programs at other schools and colleges. Reading about facilities is good but it is no substitute for a first-hand look. Study different types of facilities and how they are used to meet educational needs. Some sources of information on locations are:

- Your State university
- Your State department of education or State television authority
- National Association of Educational Broadcasters, 1346 Connecticut Avenue, N.W., Washington, D.C. 20036
- National Education Association, Department of Audio Visual Instruction, 1201 Sixteenth Street, N.W., Washington, D.C. 20036
- National Educational Television and Radio Center, 10 Columbus Circle, New York, N.Y. 10019
- National Great Plains Instructional Television Library, University of Nebraska, Lincoln, Neb., 68508
- U.S. Office of Education, Washington, D.C. 20202

Many schools and colleges are producing and using instructional television programs, but their work has not been published. If an armed forces training center is nearby, look at its facilities. Do some of your own exploring.

Employ several types of professional consultant assistance in your planning. The types of assistance will vary with the kind of operation that you plan. If you are planning a relatively simple closed-circuit operation for one or two classrooms, the professional assistance needed will be minimal. But if you are thinking about an eventual open-circuit television operation on a VHF or a UHF channel, you should employ much more consultant help. What types of consultants should you consider?

A *curriculum consultant* in instructional television and technology can be helpful in (1) analyzing your educational objectives and needs, and (2) relating objectives and needs to what should be done in instructional assistance. This is not the usual assistance given by a curriculum consultant who advises, for example, on the revision of the social studies curriculum. The use of television as a means of teaching-learning requires unique techniques for curriculum development. The best sources of such consultants are the universities and school systems that have had experience in instructional television.

A *telecommunications consultant* can work together with the curriculum consultant in (1) looking at your educational objectives and needs, and (2) relating them to instructional technology. The potential of television, radio, computers, dial-access systems, and other kinds of technology is the forte of the telecommunications consultant. He can help to broaden the horizons of teachers, administrators, and board members. This consultant also can work well with the consulting engineer (see following section) in assessing the appropriateness of different facilities which may be bought. Buying the appropriate facility, not the inappropriate or the inexpensive, is a first priority in achieving good educational results. It takes the judgment of both the consultants on telecommunications and engineering to assist you fully.

Communicate with schools, colleges, and television stations for recommendations in selecting a consultant. Other sources of help are the National Association of Educational Broadcasters and the National Education Association.

A professional consulting engineer is essential in planning for projects of any size, especially if your project involves production and transmission facilities. The engineer can save you headaches and dollars and should be in early on your planning.

The consulting engineer can provide several types of services:

- Preliminary report services, which include preliminary sketches and engineering studies, feasibility studies, and a look at the future.

- Design services, such as detailed drawings and specifications, cost estimates, and help in working with bidders and contractors.

- Services during construction, such as supervision and inspection to assure that specifications are met and that the facility operates as expected.

- Other services such as effecting changes in the project and serving as an expert witness if legal proceedings are involved.

Where should you look for a qualified engineer? Again, talk with schools and colleges that have used consulting engineers for their television installations. The National Educational Television and Radio Center has an Affiliates Engineering Committee that can help. *Broadcasting*, The Business Weekly of Television and Radio, 1735 DeSales Street, N.W., Washington, D.C. 20036, publishes a *Yearbook* that has a list of consulting engineers. Most States have engineering registration boards or engineering societies that publish directories of registered professional firms.

An *architect* can be important as you plan for ITV facilities in new schools and rehabilitated schools, or if you are constructing telecasting facilities such as studios. He should work closely with the consulting engineer and the consultant on telecommunications. Since most school administrators and board members have employed architects, the means of selecting architects and the types of services they render are not elaborated on.

A *lawyer* should advise you on such customary matters as contracts for facilities and services, liability, and the like. Two special relationships deserve some comment. Copyrights, teachers' rights, and liability for telecast materials are knotty legal problems. If you contemplate telecasting by VHF, UHF, or by 2500 mc, you will be communicating with the Federal Communications Commission in Washington. This usually requires an attorney who can advise you in such matters as the application for a license and the continuing interpretations of Federal laws and rules.

A *television station manager or program manager from an educational station* can act as a general check-point on almost any question that you may have about television facilities. Like the school administrator or the board member, he is obligated to look at the whole spectrum of a project.

Visit stations or correspond with the manager or the program director. If you are not acquainted with stations or personnel, write the National Association of Educational Broadcasters (NAEB) or the National Educational Television and Radio Center (NET) for help. Colleges usually have knowledge of station personnel and can also be helpful to you.

SPEAKING THE LANGUAGE

Learn to use some of the technical language and to recognize some of the facilities of instructional television. You don't have to be an expert yourself, but some technical knowledge can be helpful to you as you confer with your consultants and make your decisions. The following discussion is to familiarize you with some of the facilities used and the common technical language used in connection with them.

Essentially there are three main types of television systems that are used in instructional television: transmission systems, reception systems, and production or origination systems.

Transmission Systems

A transmission system is the system that distributes the television signals--that is, carries the television program--from the production center, usually a studio, to the place where you see it. A system may be one or a combination of open-circuit, by broadcast stations; closed-circuit, by cable or microwave systems; and the 2500 megahertz (mHz) 3/ or Instructional Television Fixed Service (ITFS). Instructional television can be transmitted by any or a combination of the three above, and all have their appropriate place in school operations.

Open-circuit, broadcast stations.--Broadcast stations are licensed by the Federal Communications Commission (the FCC) as either VHF (Very High Frequency) stations--channels 2 through 13; or UHF (Ultra High Frequency) stations--channels 14 through 83. An FCC license is required, and application for construction must be approved by the FCC. VHF and UHF stations are licensed for both commercial and noncommercial operations.

VHF and UHF channels have been reserved by the FCC for noncommercial use in a general geographical distribution over the Nation. Most of the channels still reserved and not used are UHF. However, channels not reserved for noncommercial use may be used for either commercial or noncommercial purposes upon approval of the FCC. Check with the FCC, Washington, D.C. 20554, if you are interested in knowing about the available channels in your area. Information Bulletin No. 16-B, April 1968, of the FCC is very informative.

Channels used for noncommercial purposes are usually referred to as ETV (educational television) channels. The licensees of such channels are expected to provide a wide range of information, culture, public affairs, entertainment, and instruction. The Carnegie Commission on Educational Television has issued a statement which helps to clarify the scope of noncommercial television:

The Commission has separated educational television programming into two parts: (1) instructional television, directed at students in the classroom or otherwise in the general context of formal education, and (2) what we shall call Public Television, which is directed at the general community.

All television, commercial television included, provides news entertainment and instruction; all television teaches about places, people, animals, politics, crime, science. Yet the differences are clear. Commercial television seeks to capture the large audience; it relies mainly upon the desire to relax and to be entertained.

3/ The prefix *mega (m)* denotes million; the term *Hertz (Hz)* is the symbol for cycles per second. Therefore, 2500 megahertz per second is written 2500 mHz.

Instructional television lies at the opposite end of the scale; it calls upon the instinct to work, build, learn, and improve, and asks the viewer to take on responsibilities in return for a later reward. Public television, to which the commission has devoted its major attention, includes all that is of human interest and importance which is not at the moment appropriate or available for support by advertising, and which is not arranged for formal instruction. 4/

Principally through the efforts of the National Educational Television and Radio Center, the Ford Foundation, and the Corporation for Public Television (created by the Public Broadcasting Act of 1967), a large proportion of the ETV stations may be interconnected for the broadcast of special cultural and public affairs programs. Hopefully they will be interconnected on a more continuing basis in the future. Furthermore, interconnections are being made among stations in several regions of the Nation.

Although television sets manufactured since 1964 are equipped to receive UHF as well as VHF, people are not often aware of this fact; so the viewing audience for a UHF station is usually not as large as it could be. Hence, you would do well to check out the potential number of viewers in your area if you are thinking of applying for a UHF license.

VHF stations can usually be received from much greater distance than UHF stations. VHF signals are strongest within an area of 50 to 60 miles but may be received at more than 100 miles. UHF stations, on the other hand, require much higher power than VHF stations to achieve the same area coverage. UHF signals need a direct line of "vision" from the transmission to the receiver.

Broadcast stations are limited to one program channel each, which is perhaps their chief disadvantage for instructional purposes.

It is possible for a school district to get a license for more than one broadcast station, and several communities are now operating with more than one. The typical pattern for a community operating with more than one noncommercial station now is one VHF channel and one UHF channel.

If you are located in a mountainous or rough terrain and want to receive broadcast station programs, you may consider the use of a TV translator, a device that relays a television signal from a broadcasting station. It converts the signal received to a different channel and rebroadcasts it. Many relatively isolated communities now receive their television programs by this means.

4/ Carnegie Commission on Educational Television. *Public Television--A Program for Action.* New York, N.Y.: The Commission.

Licensed ETV broadcast stations now operating are about evenly divided into three categories: school districts and State systems, colleges and universitites, and communities. The categories are based on what institution or agency holds the FCC license. At one time the community corporations, made up of educational cultural organizations, composed the largest number of licensees. The other categories have increased in numbers recently.

Closed-circuit or cable systems (CCTV)--These systems transmit television signals by wire and not by "wireless" as the broadcast stations do. Such systems may include only a signal receiving antenna and cable in the school building, which connects to television receivers; the signal comes from some other source. Groups of buildings may be interconnected by cable or by microwave. Microwave systems consist of special kinds of highly directional transmitting and receiving equipment (a wireless device), used by both broadcast stations and some closed-circuit cable systems. You have probably seen microwave "dishes" at the top of towers. Such dishes can be transmitting and receiving places for signals that are above 1000 mHz. Often the telephone company provides, by contract, connecting cable and microwave services. In fact, a CCTV system may include both signal transmission and reception.

An FCC license is not required for a closed-circuit cable television operation. You may operate several channels without approval by the FCC. Multiple channel capacity is one of the big advantages of CCTV.

Cable may be owned or leased, may be overhead underground. As a general rule cable is strung overhead because of the much greater expense of putting it underground. Cable runs are usually limited to 30 miles, principally because technical problems limit the length of cable which can be satisfactorily used for television transmission. Therefore, schools should be within 30 miles of the origination point (the studio sending the program). Television signals cannot be sent through cables as easily as 60-cycle electric power for ordinary household purpose.

Schools in a school district may be interconnected by cable, as in Hagerstown, Md., and Anaheim, Calif.

Some States use combinations of closed-circuit television systems, as in South Carolina. In such instances, a combination of cable and microwave facilities are interconnected. Each school or college has its own internal or distribution system.

CCTV is used by industry, the military, municipalities, and State governments. The number of closed-circuit television installations has increased considerably in the past decade, and it is likely that they will continue to increase at a rapid rate.

In a number of areas, private corporations are establishing Community Antenna Television Systems (CATV), as in the Peninsula of Michigan. Usually there is a central point where the television signals are received from several distant broadcasting stations. Cables are used to distribute selected programs to homes and schools. Often the CATV authority will offer to provide programs to schools free. Such schools would have to provide their own distribution-reception of the programs within the schools. CATV has included ETV programs in some communities. The offers need to be examined in some detail because of the limited experience with such arrangements.

The 2500 mHz, or Instructional Television Fixed Service ITFS).-- This service affords a multichannel distribution up to four channels. In cost and capability, the ITFS and the CCTV systems are relatively competitive. Both systems are limited as to the extent of area they can serve, which is less than that of a broadcast station. ITFS is reserved especially for instructional, noncommercial use and so should be considered by schools that extend over relatively small geographical areas. It is necessary to obtain approval from the FCC for ITFS operations.

ITFS broadcasts in the spectrum from 2500 to 2690 mHz. There are 31 potential channels in the 2500 to 2690 mHz range of frequency.

ITFS operates on low power. It has ten-watt power limitation. The signal generally covers an area of 8 to 25 miles in radius, depending on the height of the transmitting antenna and the receiving antenna, and the nature of the terrain. It is possible to have several ITFS systems in an urban area with no appreciable interference. The systems are specially useful in individual schools and small school districts.

The FCC has under consideration the possibility of granting a license to a single licensee for more than the customary four channels. If granted, such a system could serve both schools and municipalities on multiple channels in large as well as small communities.

ITFS television signals require special receivers. The converted signal is distributed to television sets via cable. The system must be properly engineered to assure the quality of picture to be delivered to television sets. Quality will likely be much lower between 8 to 25 miles than between 1 to 8 miles distance from the transmitter.

CCTV and ITFS systems are competitive in cost for service to a relatively small geographical area. Either system is adaptable to large school district use where there are special problems arising from rough terrain or separation of groups of schools. Broadcast stations (either VHF or UHF) are generally more useful in the larger school districts and geographical areas, either solely or in combination with CCTV and ITFS. Instructional television programs can be distributed by all three systems whether used singularly or collectively.

Any discussion of transmission systems should mention the fact that electronic technology is changing rapidly. But you can't wait for the next generation of facilities. If you do, you will never start.

There are two other developments in technology that should be mentioned--satellites and laser beams. Satellites are now being used to broadcast television programs from overseas. Some proposals have been made to use particular satellites exclusively for educational purposes. It is possible to transmit signals directly from the satellite to the school, but because of several factors, it is not practical as an immediate prospect. Laser beams are capable now of carrying large numbers of communications much beyond the capability of other means. Again, this development does not appear to have an immediate application to instructional technology, but the potential is great.

Reception Systems

Reception systems include antennas, in-school cable distribution, and television image display devices.

Antennas.--The antenna system is essential to good reception. Sometimes the reception facilities are taken for granted because the "rabbit ear" antenna seems good enough for home. The rabbit ear may be adequate at home, but another antenna system is usually needed at school for the best reception. This is especially true if good color reception is desired. Where the school is located in a poor or fringe reception area, you may need a high gain antenna and an amplifier to improve the signal quality. The amplifier is installed near the antenna together with channel converters if needed. Converters are frequently necessary for UHF reception and always with ITFS systems. This use makes possible the conversion of the frequency of UHF and of 2500 mHz down to a lower frequency (usually to a VHF channel) before the signal is carried to the television receiver by the school distribution system.

In-school cable distribution.--An in-school cable distribution system is a means of carrying the television signal from the antenna to television sets located in various places where students are viewing telecasts. This system was discussed previously in connection with transmission systems used for interconnection of schools and school districts. Reference here is made to the relatively short lines in a school.

In-school cable transmission systems may function to distribute either video or modulated RF signals.

Video systems are generally used for short cable installations in one building where there is a need for very high quality in the reception. These systems require the use of studio-type video monitors or specially modified television sets. Separate cables are used for the audio and visual signals. Visual signals are viewed on the monitors; audio signals are monitored on speakers which must be provided.

Modulated RF (Radio Frequency) systems are generally less costly than the direct video systems and are more generally used. The RF system has a multichannel capability and does not require separate audio lines. Regular television sets are used.

Television Image Display Devices.--Television is most often viewed on a regular television set, but there are other devices for special purposes. The two main types of image display devices are direct view and projection equipment.

Direct view devices include standard television sets and video monitors. Monitors are of two kinds--video and RF. Video monitors are normally used in television studios and not in schools because they have only a single signal input and require auxiliary apparatus for audio monitoring. RF monitors are standard television sets capable of receiving modulated signals from RF cable distribution systems. Monitors of this type, when connected to the cable system, will respond to signals on the cable but not to signals direct from a broadcast station as your home television set does. Direct view monitors, whether video or RF, used with a cable system, provide high quality reception, but their size is presently limited to a screen of 27 inches.

Projection equipment, that is, direct-light television projection systems, use special optical systems. Such equipment can be used in small auditoriums or large classrooms where the usual television set would be inadequate. Direct-light projection provides a large screen display. But a word of caution, check the x-ray output of the device before you buy. Modulated-light television projection systems are much more expensive than the direct-light systems. They also give much more satisfactory pictures on large screens in big auditoriums.

Production or Origination Systems

The picture and the sound must be captured at some place and time. This is production or origination.

There are some common elements to consider in a production system, such as places to put cameras and microphones, provisions and controls for light and sound, electrical power, air conditioning, and ways of controlling the facilities.

You can produce television programs without studios if your operation is confined to a classroom or a small number of rooms. All broadcast stations (VHF or UHF) require studios to make good programs possible. Studio design is a specialty. Use your consultants and look at several studios before you build.

Studio equipment is available in a wide range of quality and cost. The kind of equipment to buy will vary with the kind and quality of production you want to achieve. Cameras are the heart of a production facility. Television cameras are either black-white or color. Most broacast stations (VHF or UHF) use image orthicon cameras. Cameras of high quality are also marketed which use plumbicon and vidicon tubes. Cost of cameras and associated studio equipment is directly related to performance.

Lights, microphones, air conditioning, switching systems, audio controls, and tape recorders are important production facilities that are needed together with the cameras. Selecting such equipment requires expert knowledge beyond that which you can be expected to know. Use expert consultants. Compatability, capability, flexibility, reliability, and performance relationships of the separate facilities to one another are very important in selecting the production facilities.

Recorders are essential in most instructional television operations. Camera equipment and television tape recorders are the most expensive facilities needed to produce and reproduce programs. (Television tape recorders are also known as videotape recorders.) The recorder is an important means of quality control, play-back, multiple uses, and exchange.

Most broadcast stations use quadrature (quadruplex) recorders that have a tape 2" wide. Their quality of picture and sound is high. They are expensive. All quadrature recorders are compatible. Most television libraries stock this kind of taped programs.

Some broadcast stations and production centers use slant track or helical scan recorders, which are less expensive than the quadrature recorders. Tape recorders use a variety of tape sizes, speeds, and formats. Be wary of the slant-track recorder unless you are a sophisticated operator. There are no industry-wide standards and you could buy facilities that are incompatible. Your facilities could be lacking in capability of playing most available tapes. However, it is possible to transfer from one width tape to another, with an added cost and a loss of quality. This transfer process is known as dubbing.

Color

When you consider instructional television facilities, consider all factors relevant to both black-white and color for your transmission systems, your reception systems, and your production systems or facilities. You can start with a black-white system and convert later to color if the initial cost of color is too much. Costs of converting to color involve replacing most of the production facilities.

When you consider the possibility of starting with black-white and of converting to color, there are two technical terms to understand which apply primarily to transmitters and related auxiliary apparatus. The terms are color compatible and color capable. Standard broadcast color signals are compatible with standard black-white signals. In other words, such color signals can be received on the ordinary black-white television set and they show as black-white. Some other elements of a black-white television system are compatible with a color system, notably high quality cables, video distribution amplifiers, and video switchers.

Cameras, tape recorders, and television sets or monitors should be color capable, that is, designed especially for the showing of color. Starting with black-white compatible facilities and gradually working into color capable facilities is feasible. Costs to modify a transmitter to transmit color are relatively low. Modification and testing should be done by competent engineers. Color film chains can be purchased and the video tape recorder can be modified for color capability. Finally, color cameras for studio and film color generation must be purchased; black and white cameras are not convertible to color. Lighting requirements for color generation are higher than for black and white studio operation.

Receiving antennas and television sets will need to be replaced if you change from black-white to color. This is a major cost if you contemplate a large operation. Color is on the way, so it will pay to consider color seriously from the outset of your planning. It affects all aspects of planning.

ALTERNATIVES

Look at some alternatives before you buy television facilities. The following are among the most pertinent:

Cost accounting reports for television facilities--that is, their initial operating and replacement costs--are available at some television stations and a few universities; but there are no reliable comparative figures. So, ask for estimates when considering facilities--from the manufacturers, from your consulting engineer, and from station managers. Original facility costs vary widely as to the kinds of systems to be used; however, some assistance is available on pages 181-208 of the *Educational Television Guidebook*, 5/by Philip Lewis.

5/ This book was cited earlier in the list of publications to read for further information.

Color facilities constitute a special study. Costs are much higher than for black-white--for the initial investment, the operation of the facilities, and replacement.

Buying or leasing. Some electronic equipment can be purchased or leased. Query the manufacturers on specific items. Obsolescence is a factor in television facilities that has a bearing on whether you buy or lease. Tax savings are not a factor with schools as with business corporations.

Compatibility of facilities, especially of systems of facilities, is desirable. Start with facilities on which you can build. Build with a planned sequence of acquisition.

Service arrangements for repairs, replacement of parts, and the like can be important in a television operation where the seconds count. You may want to hire your own maintenance technicians or contract for all or part of the services.

Space is needed for facilities and for the expansion of facilities. Typically, too little space is provided at the outset; so expansion may be impeded. The engineer can be helpful in avoiding this mistake.

"Software," curriculum materials, are needed to operate. The instructional program that results from the use of the facilities is what counts. Teachers and other curriculum personnel should be involved in planning and producing sufficient quality materials. This usually requires more space and more facilities other than television facilities. For example, since television is visual to a high degree, the facilities for graphics of all types is important. This involves production and storage areas.

Financing the facilities is usually a problem Investigate beyond your own local school resources. Look at possible State and Federal funds. The U.S. Office of Education has administered funds available under several Acts of Congress, notably the Public Broadcasting Act of 1967 (Public Law 90-129, Radio and ETV Facilities Grants).

Instructional technology, not just instructional television,should be your horizon. If you are to make the best use of instructional television you will become involved in considering other electronic media, programed or structured materials, and aspects of the process called instructional technology. Television should be considered in the context of other instructional media and processes, not by itself.

Students learn in many ways. No medium, method, or process alone is suitable for all learners. There should be some options for the student so that he has a chance to control, manipulate, and discover how to use several instruments in education. Television is one instrument that should be included, as you build systems which are adapted to large groups, small groups, and individuals.

SUMMARY

Instructional television is an important medium in the field of instructional technology because it can be an effective means for improving and extending teaching-learning activities in elementary, secondary, and adult schools.

It should help to meet the educational needs of your students. You must first analyze the needs that can be met by the use of television. If the analysis shows that some of your students' needs can be met, then you are ready to think about the facilities.

The incorporation of television into your instructional program requires facilities, to be sure. It requires much more, however, which you should consider when you think about facilities. You will need specially designed curriculum materials, especially trained personnel, and a means of relating materials and personnel to facilities.

Seek expert assistance early in your planning. Study books and periodicals. Locate and view programs in operation in other school systems. Employ professional consultant personnel to help you from the outset of your planning: a curriculum consultant, a telecommunications consultant, a consulting engineer, an architect, a lawyer, and a television station manager or station program director.

Learn some of the technical language of television facilities. You don't have to be an expert linguist, but some technical language can be helpful to you when you confer with your consultants.

Finally, you will face some alternatives before you complete your planning and call for bids on facilities, such as space requirements, construction needs, maintenance levels, obsolescence, types of facilities (color or not), compatability, and the important factor of cost. Select the best facilities related to your instructional system and to your educational needs, with an eye to the future and to the costs. Technology and education do change.

You as school administrator and board member have final responsibility for making decisions concerning ITV in the school program, of discussing the role of technology in the local situation, of weighing alternatives, and of deciding on a course of action. This *Guide* should be useful to you in charting your course of action.

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PREP

P utting
R esearch into
E ducational
P ractice

No. 1-B

CONSIDERING

INSTRUCTIONAL TELEVISION?

Planning Suggestions for
School Administrators
and School Board Members

by

Kenneth E. Oberholtzer
Consultant to OE

Is instructional television meeting educational objectives and student needs?

Yes! The best answer lies in taking a look at instructional television operations in other schools and colleges. Study their results. Look at the different types of facilities and how they are being used to meet educational objectives and student needs. Note how the facilities are used in conjunction with other kinds of media, such as radio, computers, films, recorders-players, and the like. Some sources of information on the location of instructional television operations are:

- Your State colleges
- Your State department of education or the State television authority
- National Association of Educational Broadcasters, 1346 Connecticut Ave., N.W., Washington, D.C. 20036
- National Education Association, Department of Audio-Visual Instruction, 1201 16th St., N.W., Washington, D.C. 20036
- National Educational Television and Radio Center, 10 Columbus Circle, New York, N.Y. 10019
- National Great Plains Instructional Television Library, University of Nebraska, Lincoln, Nebraska 68508

What's a good first step in acquiring television facilities?

Read a few publications first to gain some technical orientation. For example, you should know about some of the most typical kinds of television systems on the market--transmission systems, reception systems, and production systems. Start your reading with the following publications:

- The Educational Facilities Laboratories, Inc. *Design for ETV: Planning for Schools with Television.* New York: The Laboratories. 1964.
- Witherspoon, John P., and Kessler, William J. *Instructional Television Facilities: A Planning Guide.* (Available in late 1969).
- Lewis, Philip. *Educational Television Guidebook.* New York: McGraw-Hill. 1961.

Should you employ consultants?

In most instances, yes! The kind of assistance needed will vary with the operation you are planning. If you are planning to start with a relatively simple closed-circuit television operation for one or two classrooms, the professional help needed will be minimal. But if you are thinking about an open-circuit television operation on Very High Frequency (VHF) or Ultra High Frequency (UHF) channels, you should consider employing several consultants, such as the following, from the outset of your planning.

. *A curriculum consultant* can be helpful in (1) analyzing educational objectives and student needs and (2) relating objectives and needs to what can be achieved by instructional television. This is not the typical kind of assistance given by a curriculum consultant who advises, for example, on the revision of the social studies curriculum. The use of television as an effective means of teaching-learning requires unique techniques of curriculum development. The best sources of such consultants are the colleges and schools that have had experiences in instructional television.

. *A telecommunications consultant* can work together with the curriculum consultant in (1) looking at your educational objectives and your students' needs and (2) relating them to instructional technology. The potential of television, radio, computers, dial-access systems, and other kinds of technology is the forte of the telecommunications consultant. He can help to broaden the horizons of teachers, administrators, and board members. This consultant can also work well with the consulting engineer in assessing the appropriateness of different facilities which may be acquired. Getting the appropriate facility, not the inappropriate or the inexpensive, is essential in achieving the desired educational results. Communicate with schools, colleges, and television stations for recommendations on selecting a consultant. Other sources of help are the National

Association of Educational Broadcasters (NAEB) and the National Education Association.

- *A consultant engineer* is vital to good planning of television projects of any size or complexity especially if your contemplated project involves studios, transmitting equipment, and distributing facilities such as cables and microwave. The engineer can save you headaches and dollars. He can help with preliminary sketches and studies, and with a look at the future. He can help with cost estimates, specifications, and the analysis of bids. During construction he can assure that the specifications are met and that the facilities operate as expected.

  Where should you look for a qualified engineer? Again, talk with schools and colleges that have used consulting engineers for their television installations. The National Educational Television and Radio Center has an Affiliates Engineering Committee that can help. *Broadcasting*, The Business Weekly of Television and Radio, publishes a Yearbook that has a list of consulting engineers. Most States have engineering registration boards or societies that publish directories of registered professional firms.

- An *architect* can be important in your planning if you are constructing new schools, rehabilitating schools, or constructing telecasting facilities such as studios. He should work closely with the consulting engineer and the consultant on telecommunications.

- An *attorney* should advise you on such customary matters as contracts for facilities and services, liability, and the like. Two special relationships deserve some further comment. Copyrights, teachers' rights, and liability for telecast materials are knotty legal problems. If you contemplate telecasting by VHF, UHF, or by 2500 megacycles, you will be working with the Federal Communications Commission in Washington. This usually requires an attorney who can advise you in such matters as the application for a license and the continuing interpretation of Federal laws and rules.

. A *television station manager or program director* from an educational television station can act as a general checkpoint with you on almost any questions that you may have about television facilities. Like you, he is obligated to look at the whole spectrum of a project. Visit educational television stations or correspond with their managers. If you are not acquainted with such stations or personnel, correspond with the National Association of Broadcasters or the National Educational Television and Radio Center.

Must you design new curriculum *materials for television facilities?*

You will need some specially designed curriculum materials. Fortunately, however, you don't have to produce all of the materials needed. There are several sources of good materials which are for rent or sale. Aside from nearby schools and colleges, some of the best sources of recorded television materials are:

. Center for Instructional Television
Eastern Education Network
575 Technology Square
Cambridge, Massachusetts 02139

. Programing Counselor
Great Plains National Instructional
Television Library
University of Nebraska
Lincoln, Nebraska 63508

. Director of Field Services
National Instructional Television Cente
Box A
Bloomington, Indiana 47401

. Director of Broadcast Services
Midwest Program on Airborne Television
Instruction, Inc.
Memorial Center, Purdue University
Lafayette, Indiana 47902

. Director of Instructional Television
Western Video Industries
1541 North Vine Street
Los Angeles, California 90028

Finally, what are some other factors that you should consider in acquiring facilities?

Buying or leasing. Some facilities can be leased; others should be purchased. It would be well to query the manufacturers on specific items. Obsolescence is a prime factor.
Costs. Initial, operating, and replacement costs are important. Ask for estimates from the manufacturers, from your consulting engineer, and from station managers. Costs vary widely.
Compatibility. Start with facilities on which you can build. Add with a planned sequence of acquisition.
Color facilities. Costs are much higher for color than for black-white--for the initial investment, the operation of facilities, and replacement.
Financing. Look beyond your local resources. There may be State and Federal funds available. The U.S. Office of Education has administered funds under several Acts of Congress, notably now the Public Broadcasting Act of 1967 (Public Law 90-129).
Service arrangements. Repair and replacement of facilities can be critical in a television operation. You may want to hire your own technicians or you may want to contract for all or part of the services.
Space. Generally too little space is provided initially, so the usual future expansion may be impeded. Your consultants can be helpful in avoiding this common mistake.

GOOD LUCK!

GOOD PLANNING AND GOOD LUCK GO TOGETHER!

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CURRENT ERIC DOCUMENTS ON ITV

The Educational Resources Information Center (ERIC), the national information system for education, is a continuing source of information on instructional television as well as other topics of interest to educators. The monthly issues of RESEARCH IN EDUCATION, the official publication of ERIC, contain abstracts of documents entered into the system, and the complete text of most of the documents can be obtained either in microfiche (MF) or hard copy (HC) from the ERIC Document Reproduction Service, The National Cash Register Company, 4936 Fairmont Avenue, Bethesda, Md. 20014.

The following are some of the documents (with their identifying numbers, pages, and prices) on instructional television entered into the system during 1968, thus representing the latest research and thinking on the subject.

- *An Investigation of Closed-Circuit Television for Teaching University Courses. ED 013 540. 106 p. MF - $.50; HC - $4.32.*
- *Planning for Instructional Television. ED 013 602. 39 p. MF - $.25; HC - $1.64.*
- *Studies in Educational Closed-Circuit Television. ED 014 213. 82 p. MF - $.50; HC - $3.36.*
- *Emerging Patterns of Instructional Television for California Public Schools. ED 014 236. 38 p. MF - $.25; HC - $1.60.*
- *Television and Education, A Bibliography. ED 014 872. 9 p. MF - $.25; HC - $.44.*
- *Television Facilities in Higher Education in New York State. ED 014 873. 57 p. MF - $.25; HC - $2.36.*
- *Instructional Television in Music Education. ED 014 882. 12 p. MF - $.25; HC - $.56.*
- *Instructional Television in Art Education. ED 014 883. 12 p. MF - $.25; HC - $.56.*
- *Television in Higher Education--Social Work Education. ED 014 884. 22 p. MF - $.25; HC - $.96.*
- *Television in Health and Physical Education. ED 014 885. 10 p. MF - $.25; HC - $.48.*
- *Television in Mathematics Education. ED 014 886. 10 p. MF - $.25; HC - $48.*
- *Television in Science Education. ED 014 887. 10 p. MF - $.25; HC - $.48.*
- *Television in Foreign Language Education. ED 014 893. 10 p. MF - $.25; HC - $.48.*
- *Learning From Television, What the Research Says. ED 014 900. 222 p. MF - $1; HC - $8.96.*